DOCUMENT RESUME

ED 255 193 IR 011 564

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TITLE Educational Adventure Games.
PUB DATE [Oct 84]
NOTE 12p.; Paper presented at the Annual Conference of the North American Simulation and Gaming Association (23rd, Iowa City, IA, October 10-12, 1984).
PUB TYPE Viewpoints (120) -- Reports - Descriptive (141) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Computer Assisted Instruction; Computer Software; *Design Requirements; *Educational Games; *Instructional Design; *Interaction; Man Machine Systems; Puzzles; *Role Playing; Visualization
IDENTIFIERS Adventure Games; *Computer Games

ABSTRACT

An adventure game is a role-playing game that usually, but not always, has some fantasy aspect. The role-playing aspect is the key element because players become personally involved when they assume a role, and defeat becomes personal and less acceptable than in other types of games. Computer-based role-playing games are extremely popular because they respond--often humorously--to input commands, and are visually vivid, regardless of their textual emphasis. The educational value of computer assisted instruction programs would be enhanced if the same active involvement could be utilized. Adventure games can be categorized into types which are exploitable in education, including the classical cave adventure that may involve a map; the puzzle type in which one must solve a problem in order to win; and a combination of map and puzzle type games. The games involve an interactive process in which the student is required to take control and make decisions. Using an adventure format to accomplish an educational goal is an effective approach that provides motivation and opportunities for role-playing, facing obstacles and challenges, and active learning. (LMM)

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NASAGA Talk

Fred D. Williams

EDUCATIONAL ADVENTURE GAMES

General Introduction

As my title states I will talk about Educational Uses of Adventure Games. Most of you probably realize that an adventure game usually takes many hours to play often in one or two hour segments. It obviously will not be possible to play a complete game in 20 minutes but I will be able to briefly describe some educational adventure games and point out what I think is their appeal and promise.

Introduction to Adventure Games

An adventure game is a role-playing game that usually but not always has some fantasy aspect.

i) In general, the player assumes the role of the adventurer by accepting the premise offered in the program, which most often is a fantasy involving black magic, ugly trolls, omnipotent necromancers, beautiful princesses, etc.

ii) The purpose of these games is to rescue a princess, or find treasure, or solve a puzzle, often by exploring a labryinth of caves and tunnels, before the evil forces residing in the program prevail.

iii) The player directs the game by commanding in English sentences what in the context of the game should be done. The computer makes sence of the command by means of a parsing routine.

It is the role-playing aspect of the game which is a key element.

i) When a player assumes the role, s/he become personally involved.

ii) Defeat becomes personal and less acceptable than in other types of games. This, I believe, can have important educational benefits.

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TO THE EDUCATIONAL RESOURCES

This type of computer game is extremely popular.

i) In fact, the best selling recreational software on the market is a game called ZORK with over 250,000 copies sold.

ii) Games of this type are extremely engaging for several reasons

(a) responses to input commands are interpreted by parsing routines which respond often humorously. This is in fact an example of a simple form of artificial (simulated) intelligence.

(b) They are visually vivid despite, or maybe because, the best are entirely textual--ie. no graphics whatsoever.

iii) If you will permit me a personal anecdote. The business of visual vividity was dramatically brought home to me several years ago when these games first started becoming popular. I got one of these games and my 12 year old daughter and I played it. Several months later a friend bought a game which included Hi-res graphics. I told my daughter that we would be able to borrow this game and that she would probably like it better than the first because of the graphics. At this point my daughter insisted that the first game contained graphics. It was not until I brought both games home and she ran the first game that she was willing to admit that there was no graphics included. The point is her imagination, involvement in the game and visualization of the game had painted such a vivid picture in her mind of the various scenes in the game that months later she could remember them in exact detail. It seemed reasonable to me if this involvement in a recreational game could be created in an educational program, the educational value of such a program would be enhanced. Let's talk about adventure games and consider how that can be done.

Descriptions of Types

For the purpose of this talk I have classified adventure games into types which I believe are exploitable in education.

A) There is what you might call the classical cave adventure after the original adventure game (called ADVENTURE) where the player wanders through a series of caves, tunnels and dungeons finding treasure and avoiding hazards such as getting lost, killer trolls, sneaky thieves or falling into molten lava.

i) Because you must know your way around the cave, a major component of this type adventure game is the map.

ii) This format is a natural for an anatomy and physiology game.

iii) The 'cave' or map rather than a random collection of passages and chambers was an accurate anatomy of the human body.

iv) The introduction to the game indicates that you will be miniaturized then injected into a human body.

-- You can explore the various parts of the body personally examining how the various parts work. For example you could go to the ear and observe where sound waves are transmitted from the air to the ear drum, then to 3 articulated bones, then to the hairs in the inner ear and finally to the brain as an electrical signal.

-- When finished you may leave the ear by following the signal in the auditory nerve to the brain. Alternatively you can leave via the eustation tube and end up in either the lungs or stomach depending other choices made in the throat. Or you can find an artery or vein servicing the ear and get into the blood stream and thereby ride to any part of the body.

v) It is the computer of course which keeps track of all the options open to the player.

vi) By learning your way around this 'cave' the player would learn human anatomy.

vii) There are other similarities with the original cave adventure and the body adventure. Whereas in the cave adventure you look for gold and treasure, in the body you attempt to discover anomalies in normal healthy body functions. That is you look for gall stones rather than gem stones.

viii) Rather than trying to avoid character-like hazards such as trolls or thieves you attempt to avoid bacteria, tapeworms or scavenging white blood cells.

ix) Natural hazards like river rapids or killer storms become turbulence in the blood stream or a sneeze while in the nose.

x) In addition to human anatomy there are probably many other cave type educational adventure possibilities:

plant or animal physiology

cell structure

geography

machine design

Indeed anything for which knowing a 'map' is important.

B) There is a second type of adventure game which I would classify as the puzzle type. In order to win the game you must solve a problem. In this type adventure the map is incidental and often trivial to the problem aspects of the game. For instance, in a purely recreational version, you must discover a murderer from clues which you discover in an old mansion.

I have used this format very successfully in a program written for a senior-graduate class in polymer science. The map is merely that of a research laboratory. The student in the context of the game is given a random unknown sample of plastic. The problem is to assemble equipment and supplies in order to perform a series of tests on the sample to establish its identity. When the equipment is assembled, experiments can be performed and raw data accumulated. There are a number of aspects to this game which I believe are educationally significant.

i) The raw data often had to be treated (massaged) before interpretation.

ii) Library work was required.

iii) Student can also perform improper or downright foolish reactions such as reacting Na with H2SO4. This causes an explosion and the player undergoes a computer death.

iv) Some 'experiments' must be performed on expensive or difficult to use equipment. This is important to small or equipment poor schools.

v) Because of the complexity of the game the students found out that collaboration was beneficial. This I believe is a positive attribute since collaboration is a plus in the real world (but is often equated with cheating in academia.)

vi) Incidental information can be imparted. For instance looking at the wall will show pictures of former Nobel Prize winners in polymer science. (or lost in maze!!)

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C) There are of course use a combination of map and puzzle type game. For instance I wrote a sex education adventure called Make'n a Baby. (This is an adventure in which most everyone becomes involved and which we were all curious about but not usually with a computer.) The map in this game is the internal anatomy of the male and female genital organs. In the game the player is miniaturized and initially is injected into a male urogenital tract. The purpose of the game is to diagnose and treat a number of physiological problems which prevent the conception of a baby. Individual problems included low sperm count, improper acidity of prostatic fluid, blocked fallopian tube, ectopic pregnancy, etc. The educational purpose, of course, is to have the player learn the internal anatomy and physiology of reproduction. By learning the map you learn anatomy. Solving the problems teaches the physiology of reproduction.

Many options are offered to the player who must make all the decisions. For instance, the current slide is what a player who has just ~~arrived in the female vagina~~ started the game would see. The player ~~has already visited~~ must explore the male urogenital region ~~and has had~~ to diagnose and treat several male reproductive problems including prostatic fluid with improper pH, broken spermatic duct, impotency, hormonal problems, etc before riding over to the female in a sperm cell. LATER In the female the player will have to diagnose and treat yeast and bacterial infections, blocked fallopean tubes, hormonal imbalances, and finally an ectopic pregnancy. In playing the game the nature of reproduction and conception are learned almost incidentally to the game itself.

Interaction with the computer is required in these games. They just don't work without decisions being make--where to go, what to look at, what to do when some problem is discovered. The two key ideas here are control and decision making . If the game is written with more than a recreational goal in mind-eg EDUCATION-then the program can direct the player through a series of decisions

and/or discoveries in which the student feel s/he has control. In other words the educational process is an active process in which the student feels in control.

Sex education is for some strange reasons, often embarrasing to both parent or teacher and the student. Using a computer to help teach sex education is a non-threatening, non-embarassing first step.

Observations

I think few will argue that students would prefer to play games than study or do homework. Yet a great deal of learning must take place before anyone can complete an adventure --albeit learning your way around a cave or how to avoid a troll. It is my observation and contention that using an adventure format to accomplish an educational goal is an effective approach. Retention of learned material is outstanding. Although no systematic comparative study has been performed, I observed in examinations that any question, which was related to material that had been a part of the adventure game, was more thoroughly answered than other questions. Approximately a year after the adventure game assignment, students could still remember in vivid detail the method of performing certain tasks, and the method of determining types of data or the physical description of some location, instrument, organ or cell. Why is this?

Review

Lets review some of the points that I have been trying to make about educational adventure games.

1) dedication--you try to complete a game whereas homework is often a drudge.

2) role-playing--As mentioned previously, when a student/player accepts the premise of a program (ie to be shrunk to the size of a bacterium and injected into a body or to be a worker in a laboratory) then defeat or the inability to complete the task is taken very personally. As a result students voluntarily spend large amounts of time thinking about the problem.

3) obstacle and challenge--Homework is often regarded as an obstacle which must be overcome before a student can proceed onto something which s/he would rather do. When the same homework is included as part of a game it becomes a challenge. A student may accept a challenge but avoid an obstacle. Or put in another way, in this format problems can be make into challenges which cannot be easily laid forgotten.

If you will permit me another anecdote...For years in my graduate polymer course I have required the students to solve a particularly elaborate problem. Every year the students would complain. I would also hear from other faculty because the students would complain to them that they couldn't do their other homework because of my 4-5 hour problem. Since I included this problem as part of the adventure game I have not heard one complaint. In fact one of my colleagues admonished me for making my assingment so enjoyable.

4) active learning--In an adventure game the student/player is in what some people an exploratory environment where the learning experience belongs to the learner. Usually students are passive learners. Furthermore the player has

the illusion that s/he is in control of the situation. Not only can the student act and experiment, s/he must act and experiment in order to accomplish the gameing and thereby the educational goal. The player must make decisions what to do next, accumulate information and must synthesize the data to come to some conclusion.

SCIENTIFIC METHOD

In a educational adventure game the student player may explore unfamiliar territory such as a laboratory and must overcome hazards such as a chemical explosion, virulent bacteria, recalcitrant colleagues, supercilious professors, and most of all his own ignorance in order to perform experiments or to solve a series of problems. If the program is properly constructed, logical and proper procedures must be employed by the student.

I think educational adventure games when properly constructed are actually simulations of the scientific method. The student attempts, by exploring, deciding, testing and trying various options to solve some problem. In this environment the student through this gaming approach is permitted to stumble, to err, to attempt different and dangerous things and, most important, to learn by discovery. Vicarious learning is achieved by successfully playing the game.

SOME FUTURE POSSIBILITIES

i) Use of foreign languages either as the input command, the descriptive text, or both

ii) Historical adventures (including biblical stories)

iii) Ethical values

iv) Psychology-- There is another variation on adventure games that I didn't mention earlier,in which the personality and other characteristics of you as the main character in the game changes as the game progresses. These changes in strength, charisma, experience, charm, irritability, etc are determined by the decisions which are made while the game is being played. I have not used this type educationally but I believe there are some interesting possibilities.

v) Science-- I am certain that there are many applications of useing this approach in science games in which the scientific method is required in order to successfully complete the game.

CONCLUSION

In summary, educational adventure games are a worthwhile addition to the art and science of educational programming. Learning both the complex material of senior level science/engineering courses and the voluminous material of beginning anatomy and physiology courses is aided by there programs. Finally, adventure games actually use the scientific method of discovery and evaluation.